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# Wage inflation and labour conflicts in the Netherlands

## An empirical investigation using the co-integration approach

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The 'wage space', which is defined as the sum of price inflation and labour productivity growth, has played a major role as an indicator of allowable wage increases in the post-war wage negotiations in the Netherlands. This paper shows that: (a) wages and the wage space are co-integrated; (b) the deviation between wages and the wage space may act as an error correction term in the wage equation when both variables are identified as $I(2)$; and (c) political consensus and the threat of labour conflicts (rather than actual strike activity) may be identified as the 'mechanism' behind this error correction in the wage equation.

### 1. Introduction

Institutional aspects play a prominent part in labour relations and theoretical and empirical modelling in this field of economics may differ from country to country. Against this background we look at the specific role of the so-called wage space in wage negotiations in the Netherlands. The wage space is defined as the sum of price inflation and labour productivity growth. Wage negotiations between employers' federations and trade union federations in the Netherlands are traditionally conducted at a central level, and the wage space indicates the room for manoeuvre of negotiators from a macroeconomic point of view. This paper investigates to what extent the wage space has been a leading determinant in wage formation and to what extent (temporary) deviations of wages from the wage space have led to labour conflicts. The consensus on wages following the wage space may be interpreted as a 'protocol' to prevent labour unrest: Any deviation from the protocol which is unfavourable to the employees may cause the penalty of

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strike. This interpretation, in fact, comes close to joint cost theory, which predicts that those contingencies which will lead to expensive strikes are covered in an advance agreement, or protocol [see Kennan (1986)].

The paper is set out as follows. After an institutional survey in the next section, section 3 first determines the order of integration of variables defined in this study and then tests for co-integration between wages and the wage space in order to see whether there is a stable long-run relationship between these two variables. Section 4 gives an empirical analysis of the contribution of labour conflicts to this relationship, whilst section 5 shows how both the wage space and the threat of labour conflicts play a dual role as the error correction mechanism in the wage formation process. Some conclusions are drawn in section 6.

## 2. Institutional survey

In the post-war period we distinguish four different regimes in wage negotiation and wage formation in the Netherlands. The first regime identified the 1945–1962 period. This period is characterized by the so-called 'strictly guided wage policy', when wages were determined at the national level. The main aim of this government wage policy was to have wage increases restricted to the growth rate of labour productivity; at the same time the government pursued a strict price policy. During this regime, a governmental institution had the formal power to invalidate wage increases which were inconsistent with the government's objectives. However, in the last three years of this period (1960–1962), the government allowed inter-industry variation in wage increases.

The second regime, from 1963 to 1969, formed a transitional stage. Wage determination alternated between free negotiations and government intervention. Wages in industries were negotiated with an eye to both the productivity of the industry itself and a national trend. From 1963 to 1969 wages were determined freely at the industry level except for 1966 and 1967. The third regime lasted from 1970 to 1982. In this period, wage formation in the private sector became formally free of government intervention. However, the government kept its authority to interfere in the wage formation process if the outcomes of the 'free negotiations' were inconsistent with its economic policy objectives. In such cases, the government could issue so-called national wage pauses, which froze the level of wages for half a year but left the automatic price compensation schemes (which existed from 1969 to 1982) unaffected. It is important to notice that the centralized structure of wage determination remained intact in this regime. Before the start of the yearly negotiation rounds in the industries and/or enterprises, central negotiation rounds took place between the trade union federations, the employers' federations and the government. The aim of these meetings was to provide

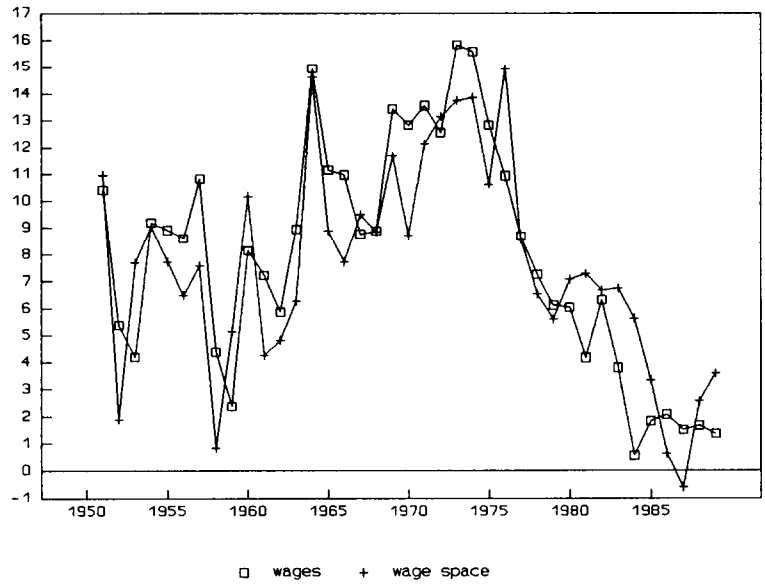


Fig. 1. Wages and the wage space, 1950–1989 (percentage changes).
*Source*: Central Planning Bureau.

guidelines for the negotiations at industry and enterprise level with respect to limits for wage increases against the background of macroeconomic development. The fourth wage formation regime runs from 1983 to the present date. After a central agreement in 1982, the government ended its formal interference in wage negotiations. However, the government still indicates which wage increase would be desirable from a macroeconomic policy point of view. This indication has an immediate impact on wage negotiations both at the central and at the industry or enterprise level.

This survey shows that, in all four regimes, wage negotiations in the Netherlands have consistently been guided by directives at a central level. With this interventionist government policy, the sum of labour productivity and consumer price increases has always acted as a main indicator for allowable nominal wage increases in the market sector. The post-war history of wage formation in the Netherlands therefore suggests a stable relationship between changes in wages and the wage space. This institutional aspect, rather than a theoretical framework, constitutes the basis for our empirical study in this paper. Under this standard for allowable wage increase, we recognize that fluctuations in the terms of trade are shifted to the employers, and a deterioration will therefore increase the share of labour in the national income, as do wage increases which exceed the wage space.

At first sight fig. 1 confirms the suggestion of a firm link between wage

increases and the wage space. It also shows, however, that wage increases have exceeded the wage space in a number of years (especially during the periods 1953–1958 and 1968–1974), and, moreover, at the beginning of the 1980s the wage space had not been completely exhausted by wage increases. Note that the wage space is defined in growth rates since it relates to allowable wage *increases*; when looking at levels, the appropriate comparison is thus between the *cumulated* wage space and the wage level.

In spite of this link between the wage rate and the wage space, the distribution of income has exhibited large shifts in the post-War period. The share of labour in the national income, as measured by the labour income ratio (the precise definition is in the appendix), has fluctuated around 72% in the 1950s. However, wage increases which exceeded the wage space in the 1960s and 1970s, and the deterioration of the terms of trade due to the oil-crises shocks, have contributed to a steady rise in the labour income ratio from 72% in 1961 to 92% in 1981. Since 1982 this ratio has dropped (being 79% in 1989) due to union wage restraints and an improvement in the terms of trade.

## 3. Co-integration of wages and wage space in the Netherlands

Prior to the testing of the existence of a long-run relationship between wages and the wage space by co-integration tests, we should determine their order of integration as well as the order of integration of the other variables of this study[1] [see, e.g., Engle and Granger (1987); and Hall and Henry (1988)]. Table 1 presents results derived from a number of unit root tests which test for AR(1) or AR($p$) processes: DW is the Durbin–Watson test; DF is the Dickey–Fuller test without a constant term; $DF_c$ the Dickey–Fuller test including a constant term; and $DF_t$ the Dickey–Fuller test with a trend. The test results under the headings ADF relate to the augmented Dickey–Fuller tests, defined in an analogous way. For all relevant variables the integration tests have been performed both on levels, on first differences (growth rates), and where necessary on the first differences of growth rates. The null-hypothesis of both the DW-test and the Dickey–Fuller test is the existence of a unit root. This null-hypothesis is rejected when the DW-statistic exceeds its critical value given at the bottom line of table 1; whereas a DF-statistic which is below its critical value, leads to a rejection of the null-hypothesis.[2]

[1]The appendix gives the list of symbols and provides short definitions of the variables specified in this study.

[2]For the DW-test the null-hypothesis reads that the correlation between the error terms equals 1, or DW = 0, which implies that the variable will be integrated of integration order 1, $I(1)$, if the DW-statistic is below its critical level. The null-hypothesis of the DF-test is that the correlation between the first difference of a variable and its lagged level is 0, which alternatively implies that the variable will be integrated of order 1, $I(1)$, if the $t$-value of the estimated correlation coefficient is insignificant.

Table 1

Unit root tests for all variables of this study, 1950–1989.[a]

| | DW | DF | $DF_c$ | $DF_t$ | ADF | $ADF_c$ | $ADF_t$ | Order of integration |
|---|---|---|---|---|---|---|---|---|
| $\log w$ | 0.01 | +7.47 | −2.20 | +7.98 | +0.79 | −1.04 | +0.59 | |
| $\Delta \log w$ ($\dot{w}$) | 0.40 | −1.26 | −2.00 | −1.39 | −0.81 | −1.76 | −0.86 | |
| $\Delta \dot{w}$ | 2.01 | −6.86 | −6.76 | −6.79 | −6.48 | −6.39 | −6.46 | 2 |
| $\log p_c$ | 0.01 | +8.75 | +0.24 | +3.44 | −2.53 | +0.16 | +1.08 | |
| $\Delta \log p_c$ ($\dot{p}_c$) | 0.77 | −2.31 | −3.42 | −3.28 | −1.04 | −2.03 | −1.08 | |
| $\Delta \dot{p}_c$ | 1.89 | −9.18 | −9.00 | −9.09 | −7.31 | −7.19 | −7.32 | 1,2 |
| $\log h$ | 0.01 | +8.05 | −2.16 | +6.35 | +3.18 | −2.29 | +4.04 | |
| $\Delta \log h$ ($\dot{h}$) | 1.37 | −2.15 | −4.46 | −2.75 | −1.62 | −3.81 | −2.10 | |
| $\Delta \dot{h}$ | 2.55 | −8.16 | −8.04 | −8.05 | −7.76 | −7.65 | −7.32 | 1,2 |
| $\log ws$ | 0.01 | +11.1 | −1.35 | +7.10 | +2.36 | −0.74 | +2.16 | |
| $\Delta \log ws$ ($\dot{ws}$) | 0.83 | −1.61 | −3.15 | −2.16 | −0.85 | −2.13 | −0.90 | |
| $\Delta \dot{ws}$ | 2.48 | −9.42 | −9.28 | −9.32 | −6.48 | −6.39 | −6.42 | 1,2 |
| *gap* (level) | 0.10 | −0.51 | −1.52 | −2.09 | −0.43 | −1.71 | −2.02 | |
| *gap* (%-change) | 1.56 | −4.77 | −4.79 | −4.70 | −4.11 | −4.09 | −4.04 | 1 |
| $u$ | 0.04 | +1.13 | −0.00 | −1.39 | −0.38 | −1.13 | −2.40 | |
| $\Delta u$ | 0.79 | −2.91 | −2.95 | −2.98 | −3.79 | −3.86 | −4.03 | 1 |
| $tp$ | 0.01 | +3.33 | −1.02 | +2.50 | +2.08 | −1.39 | +2.25 | |
| $\Delta tp$ | 1.48 | −3.76 | −4.94 | −4.18 | −2.64 | −3.61 | −2.95 | 1 |
| $\log wdl$ | 1.90 | −1.64 | −5.91 | −3.04 | −1.10 | −5.03 | −2.21 | 0 |
| $aiq$ | 0.15 | −0.18 | −1.17 | +0.62 | −0.09 | −1.43 | +0.72 | |
| $\Delta aiq$ | 1.72 | −5.48 | −5.41 | −5.44 | −4.80 | −4.74 | −4.78 | 1 |
| $aiq_c$ | 0.06 | +1.17 | −0.92 | +0.72 | +1.28 | −1.07 | +1.03 | |
| $\Delta aiq_c$ | 2.03 | −6.19 | −6.40 | −6.25 | −4.84 | −5.14 | −4.96 | 1 |
| Critical values ($\alpha = 5\%$, $n = 50$) | 0.49 | −1.95 | −2.93 | −3.50 | −1.95 | −2.93 | −3.50 | |

[a]The dot notation indicates a percentage change; the ADF-test is specified with a one year lag; when in the last column two figures for the order of integration are given the test statistics are inconclusive.

As wages are mainly determined in annual contracts, we have based our empirical analysis on annual data. This results in a relatively low number of observations – only 40. Therefore, the discriminatory power of the tests is low so that, as indicated in the last column of table 1, the order of integration of a number of variables cannot be determined unambiguously. This ambiguity also characterizes the findings of Graafland and Huizinga (1988). In order to interpret the time-series properties of the variables, Dolado and Jenkinson (1987) advocate the procedure of testing for a unit root in the most general model, including a constant and a trend term. If the null-hypothesis of a unit root cannot be rejected, one should proceed with the more restricted model by first dropping the trend term, and if necessary also the constant. Unfortunately some test results remain inconsistent: We find the wage gap to be $I(1)$, while its two component parts, the wage level

Table 2

Co-integration regressions under the presumption that wages are of order $I(1)$, 1950–1989.[a]

$$\log w = \alpha_1 \log p_c + \alpha_2 \log h + \alpha_3 \log ws + \alpha_4 u + \alpha_4^* u_{-1} + \alpha_5 tp.$$

| | $\alpha_1$ log $p_c$ | $\alpha_2$ log $h$ | $\alpha_3$ log $ws$ | $\alpha_4 u$ | $\alpha_4^* u$ | $\alpha_5 tp$ | $\bar{R}^2$ | CRDW | DF | ADF |
|---|---|---|---|---|---|---|---|---|---|---|
| (a) | 0.71 | 1.49 | – | – | – | – | 0.9986 | 0.56 | −2.10 | −2.58 |
| | (14.5) | (22.8) | | | | | | | | |
| (b) | 1.07 | 1.17 | – | −1.69 | – | – | 0.9992 | 0.92 | −3.05 | −3.59 |
| | (13.8) | (14.8) | | (5.3) | | | | | | |
| (c) | 1.07 | 1.17 | – | – | −1.80 | – | 0.9996 | 1.10 | −3.48 | −4.60 |
| | (24.8) | (25.3) | | | (10.4) | | | | | |
| (d) | 0.99 | 0.95 | – | – | −1.77 | 1.00 | 0.9998 | 1.57 | −4.90 | −4.10 |
| | (31.0) | (28.9) | | | (15.0) | (6.5) | | | | |
| (e) | – | – | 0.97 | – | −1.72 | 0.98 | 0.9998 | 1.57 | −4.87 | −4.12 |
| | | | (44.9) | | (20.5) | (6.8) | | | | |

[a]The constant is omitted to save space; $t$-values in parentheses; the asterisk (*) denotes an alternative specification possibility; the ADF is specified with a one year lag.

and the cumulated wage space are $I(2)$ and an undecided $I(2)$, $I(1)$, respectively.

The most puzzling outcome of these integration tests is the clear indication that wages are $I(2)$, whereas the cumulated wage space and its component parts are undecided $I(1)$ or $I(2)$. From a statistical point of view, the most intelligible decision is to regard the cumulated wage space as $I(2)$ and hence to test for co-integration between wage increases and the wage space, which under this assumption are both $I(1)$. This is in conformity with the institutional survey and with visual inspection on fig. 1. However, this implies specifying a (short-run) wage equation in second differences (with the acceleration of the wages as the dependent variable), which is rather unusual. Therefore we will follow two parallel lines of examination, and investigate co-integration on the presumption that wages are either $I(2)$ or $I(1)$. In the latter case we overrule the outcomes of the integration tests.

The next step is to estimate the co-integration regression. In case two variables, $x$ and $y$, are co-integrated, the residuals of the estimated regression between $x$ and $y$ must be stationary, i.e., of integration order $I(0)$. For this purpose the same tests as that used for stationarity are used, but with a different null-hypothesis: The null-hypothesis reads now that the *residuals* have a unit root. So, when the value of the DW-statistic (commonly called 'the CRDW-statistic') exceeds its critical value, or when the DF-statistics are significant (are below their critical levels), the null-hypothesis is rejected against the alternative hypothesis of co-integration.[3]

On the presumption, first, that wages are of order $I(1)$, table 2 gives the estimation results for a number of alternative specifications. Eq. (a) gives the

[3]Critical values for the DF-test (and the ADF-test) are: −3.67 (−3.25), −4.11 (−3.65), −4.35 (−3.95), −4.76 (−4.25), for 2, 3, 4 and 5 variables, respectively. See Engle and Granger (1987), and Blangiewicz and Charemza (1989).

long-run wage equation with the price level and labour productivity as explanatory variables. Modern bargaining theory, however, suggests the inclusion of other variables like the unemployment level, the level of taxes, and a variable capturing the difference in value added and consumer prices [for recent applications for the Netherlands see, e.g., Knoester and Van der Windt (1987); Graafland and Huizinga (1988); and Lever (1990)]. Eq. (b) therefore shows the co-integration regression including the unemployment level as an explanatory variable. This inclusion is statistically sound, as, according to table 1, unemployment is also $I(1)$. However, the fit of unemployment appears to be much improved by specifying it with a one year lag [eq. (c) of table 2], which is not formally compatible with the specification of a co-integration regression, since the long-run equation cannot be dynamically specified. There is, however, an economic justification underlying this specification change; wages are typically negotiated at the beginning of the year, whereas data on current unemployment are forecasts which have often proved to be unreliable.[4] Eq. (d) extends the specification of the long-run wage equation with another variable suggested by modern wage bargaining theory, namely the burden of taxation. Now the hypothesis of co-integration is no longer rejected. We have also attempted to include the difference between consumer prices and value added prices as an explanatory variable (not shown in table 2). However, this variable appeared not to be significant in the regressions, and when we corrected the wage space for value added prices (i.e., defining the 'corrected' wage space as the sum of value added prices and labour productivity) the test statistics indicated that there is no co-integration between wages and the 'corrected' wage space. Finally eq. (e) combines the price level and labour productivity into one explanatory variable: The cumulated wage space. The regression result hardly differs from that of eq. (d).

Eq. (e) of table 2 is our preferred long-run wage equation under the assumption that wages are of order $I(1)$. According to this equation a long-run relationship between the cumulated wage space and the wage level only exists under the ceteris paribus condition of no permanent changes in unemployment and taxation policy.

Table 3 gives the results of the co-integration regression under the presumption that wages, the (cumulated) wage space, and its component parts are of order $I(2)$.[5] The regressions are specified both with and without a constant term. According to the test statistics, all regressions of the table except (a) indicate co-integration between wages and the wage space

[4]Graafland and Huizinga (1988) also use a lagged unemployment variable in their specification of the long-term wage equation for the Netherlands.

[5]Note that neither the unemployment rate nor the tax variable can appear in the co-integration regression, if we assume that the other explanatory variables are of integration order $I(2)$.

Table 3

Co-integration regressions under the presumption that wages are $I(2)$, 1950–1989.[a]

$$\dot{w} = \beta_0 + \beta_1 \dot{p}_c + \beta_2 \dot{h} + \beta_3 w\dot{s}.$$

| | $\beta_0$ | $\beta_1 \dot{p}_c$ | $\beta_2 \dot{h}$ | $\beta_3 w\dot{s}$ | $\bar{R}^2$ | CRDW | DF | ADF |
|---|---|---|---|---|---|---|---|---|
| (a) | 0.94 | 1.05 | 0.75 | – | 0.714 | 1.23 | −4.08 | −3.20 |
| | (1.1) | (8.4) | (4.7) | | | | | |
| (b) | – | 1.14 | 0.87 | – | 0.712 | 1.44 | −4.62 | −3.67 |
| | | (11.7) | (6.9) | | | | | |
| (c) | 0.82 | – | – | 0.94 | 0.706 | 1.43 | −4.48 | −3.81 |
| | (1.0) | | | (9.6) | | | | |
| (d) | – | – | – | 1.02 | 0.706 | 1.61 | −4.95 | −4.28 |
| | | | | (23.1) | | | | |

[a] $t$-Values in parentheses; the ADF is specified with a one year lag.

variables.[6] We prefer the parsimonious specification (d). As the coefficient of the wage space in this equation does not differ significantly from unity, we set it equal to unity. By defining the wage gap (*gap*) as the difference between wage growth and the wage space, a simple DF-test confirms the alleged long-term relationship between wages and wage space, without ceteris paribus conditions. The presumption that wages are $I(2)$ therefore enables us, as we shall see, to give an economic interpretation of the error correction mechanism.

## 4. Labour conflicts and the wage space

The dominant role of the wage space in Dutch wage negotiations poses the question of whether wage offers by employers associations, which are far below the wage space, or wage demands by trade unions which are far above the wage space, lead to tension in the negotiation process and hence to labour conflicts. If this is so, the threat of labour conflicts would act as a stabilizing device in the long-run relationship between wages and wage space. Strike activity may be regarded as an empirical measure of labour conflicts. We have therefore tested the hypothesis above using a regression equation with strike activity, measured as the logarithm of the number of working days lost in strikes ($\log wdl$), as the dependent variable, and either the wage gap, or the cumulated wage gap, as the independent variable; the cumulated wage gap (*gap*, see list of symbols) being defined as the difference between wages and the cumulated wage space.

A regression explaining strike activity by means of the cumulated wage gap did not yield a satisfactory fit. Moreover, from table 1 we learn that

[6] Including a variable which corrected for the difference between the change of value added prices and consumer prices, or defining the wage space in value added prices gave problems identical to those mentioned above.

Table 4

Strikes and the labour income ratio, 1950–1989.[a]

$\log wdl = \gamma_0 + \gamma_1 \Delta aiq_{-1} + \gamma_2 \Delta aiq_{c-1}$.

| | $\gamma_0$ | $\gamma_1 \Delta aiq_{-1}$ | $\gamma_2 \Delta aiq_{c-1}$ | $\bar{R}^2$ | DW |
|---|---|---|---|---|---|
| (a) | +3.77 | −0.34 | – | 0.16 | 1.77 |
| | (18.4) | (2.8) | | | |
| (b) | +3.84 | – | −0.32 | 0.19 | 1.76 |
| | (19.0) | | (3.1) | | |

[a]$t$-Values in parentheses.

$\log wdl$ is of order $I(0)$, while $gap$ is of order $I(1)$. Therefore, we restrict the analysis of the relationship between labour conflicts and the wage space to a specification where strike activity is explained by changes in the wage gap ($\dot{gap}$). This is in line with the institutional survey which suggests that the wage space itself rather than the cumulated wage space has been regarded as the room for allowable wage increases. The following equation describes this relationship between strike activity and the extent to which the wage space has been used for wage increases (reference period 1950–1989, $t$-values in parentheses).

$$\begin{array}{lll} \log wdl = 3.85 - 0.21\, \dot{gap}_{-1} & \bar{R}^2 & \text{DW} \\ \quad (17.9) \quad (2.3) & 0.10 & 1.86 \end{array} \qquad (1)$$

The wage-gap variable in this equation is specified with a one year lag. An explanation for this lag is that wage negotiations, and hence strike activity in the Netherlands, takes place in the beginning of the year when only macroeconomic data for the previous year are available to the negotiators. Moreover, the introduction of this lag unambiguously defines the direction of causality in the relationship between strike activity and wage increases investigated in this section [for more empirical research into this causal relationship, see Den Butter (1989)]. For the wage gap variable we find a significant coefficient value with the expected negative sign. Eq. (1) above predicts a high level of strike activity in the next year, when this year's negotiations have resulted in wage increases which are below the wage space. On the other hand, there will be little strike activity in the next year when a high wage increase as compared to the wage space is obtained.[7]

The estimation result for eq. (a) in table 4 shows that the change in the labour income ratio ($\Delta aiq$) as a determinant of strike activity yields a somewhat better fit than the wage gap variable in eq. (1). In practice, the difference between a change in the wage gap and a change in the labour

[7]Lagging the wage gap more than one year, using a combination of weighted averages or a cumulation of the wage gap, did not improve the explanation significantly.

income ratio is (mainly) due to changes in the terms of trade.[8] Indeed, when we regressed strikes (log *wdl*) on the wage space corrected for the difference between consumer and value added prices (not shown in table 4), we obtained the same results as eq. (a) in table 4. However, including the wage space defined in value added prices in the co-integration equation gave a downswing in the test statistics. Eq. (b) of table 4 indicates that strike activity is slightly better explained when the labour income ratio is corrected for capital intensive industries, for instance the production of natural gas (a correction which is commonly used in macroeconomic analyses of the Netherlands).[9] Finally, we conclude from the better fit of eq. (a) in table 4 as compared to eq. (1), that unions make allowances for changes in the terms of trade when considering a strike, but that this effect does not play a role in long run wage formation.

## 5. Wage formation and the wage space

In section 3 we have run co-integration regressions under the presumptions that wages are of order $I(1)$ or $I(2)$. However, the previous section teaches us that strikes are uncorrelated with the wage gap specified in levels. This means that the analysis of the relation between labour conflicts and wage inflation should be restricted to a short-run wage equation where wages are presumed to be of order $I(2)$. By means of this short-run equation, we now investigate the role of strikes in the error correction mechanism which induces the stable long-run relationship between wages and the wage space. Thus, we specify the difference between wage increases and the wage space (the wage-gap variable: *gàp*) as the error correction term, instead of the residuals of the co-integration equation as suggested by co-integration theory. This specification enables us to give the error correction term an economic interpretation[10] (namely; 'who corrects the error?'). This procedure contrasts with that followed by most empirical studies on co-integration and error correction, where the error correction mechanism is usually considered as a mere mechanical device to obtain a neat statistical specification of the

[8]Ignoring the influence of indirect taxes, we may write $\dot{p}_c = \dot{p}_y + 0.6(\dot{p}_e - \dot{p}_m)$ expressing a difference between the change in consumer prices ($p_c$) and in value added prices ($p_y$); with $\dot{p}_e$ as the change in export prices, and $\dot{p}_m$ the change in import prices.

[9]The theory implied in eq. (b) of table 4 may, however, differ somewhat from that of eq. (1). In modern theoretical microeconomic bargaining models, incomplete and asymmetric information on the firm's (expected) profitability constitutes an important determinant for the occurrence of strikes [see, e.g., Card (1988); Tracy (1986); Farber (1978)]. At the macro level the (change in the) labour–income ratio (whether or not corrected) may be regarded as a measure of profitability. Hence, the equations in table 4 can be interpreted as a test for this micro theory on a macro level. If in one year profitability increases, there will be much strike activity in the subsequent year.

[10]Note that the wage gap variable is approximately equal to the residuals of eq. (d), table 3.

Table 5

Estimation results for the wage equation in the Netherlands, 1950–1989, under the presumption that wages are of order $I(2)$.[a]

$$\Delta\dot{w} = \delta_1 \Delta w\dot{s} + \delta_2 \Delta u_{-1} + \delta_3 \log wdl + \delta_3^* g\dot{a}p_{-1}.$$

| | $\delta_1 \Delta w\dot{s}$ | $\delta_2 \Delta u_{-1}$ | $\delta_3 \log wdl$ | $\delta_3^* g\dot{a}p_{-1}$ | $\bar{R}^2$ | DW/$H$ |
|---|---|---|---|---|---|---|
| (a) | 0.46 | – | – | – | 0.35 | 2.23 |
| | (4.5) | | | | | |
| (b) | 0.48 | −0.84 | – | – | 0.42 | 2.31 |
| | (5.0) | (2.4) | | | | |
| (c) | 0.48 | −0.84 | 0.55 | – | 0.49 | 2.34 |
| | (5.3) | (2.5) | (2.3) | | | |
| (d) | 0.63 | −1.10 | – | −0.65 | 0.69 | 0.20[b] |
| | (8.4) | (4.2) | | (5.6) | | |

[a]The constant term ($\delta_0$) is left out to save space; $t$-values in parentheses; an asterisk indicates an alternative specification possibility.
[b]Durbin's $H$-statistic (as the lagged dependent variable is taken as explanatory variable).

wage equation with satisfactory long-run properties.[11] Our estimation results for the short-term wage equation including the error correction explained by strike activity are presented in table 5.

Eq. (a) in table 5 gives the short run influence of (changes in) the wage space on (the acceleration of) wages. Eq. (b) in the table includes the effect of changes in unemployment, which is, however, one order of integration higher than the traditional Phillips-curve equation. In eq. (c) of table 5, actual strike activity is taken as an explanatory variable, in addition to the first difference of the wage space and the unemployment rate. Like the other two explanatory variables in eq. (c), the coefficient value of strike activity has the expected sign, and it also differs significantly from zero.

When we take the wage gap ($g\dot{a}p_{-1}$) instead of actual strike activity as the additonal explanatory variable (and hence substitute eq. (1) in wage eq. (c), table 5), we obtain even better estimation results. This is shown in eq. (d), table 5. In this equation the wage gap is correctly specified as an error correction term, since we have tested that wages and the wage space are co-integrated and the results were consistent with a unit value for the long-run relationship between the wages changes and the wage space.

It is our inference from these estimation results that the threat of labour conflicts is responsible for the error correction, rather than actual conflicts. We believe this to be so because of the better fit of eq. (d) as compared to that of eq. (c), and because the number of working days lost to industrial disputes is rather small in the Netherlands [see, e.g., Walsh (1983)].

[11]The specification of a wage equation in the first differences of percentage changes (the acceleration of wages) is in conformity with our results from the unit root tests, but it contrasts with a number of recent empirical studies on the Dutch wage equation using the co-integration approach [e.g., by Graafland and Huizinga (1988) and Mulder (1990)].

Table 6

Estimation results for the short-run wage equation in the Netherlands, over two sub-periods 1950–1962, 1963–1988.[a]

$$\Delta\dot{w} = \theta_0 + \theta_1 \Delta w\dot{s} + \theta_2 \Delta u_{-1} + \theta_3 \log wdl + \theta_3^* g\dot{a}p_{-1}.$$

| | $\theta_0$ | $\theta_1 \Delta w\dot{s}$ | $\theta_2 \Delta u_{-1}$ | $\theta_3 \log wdl$ | $\theta_3^* g\dot{a}p_{-1}$ | $\bar{R}^2$ | DW/$H$ |
|---|---|---|---|---|---|---|---|
| 1950–1962 | | | | | | | |
| (a) | 0.41 | 0.57 | −3.90 | −0.01 | – | 0.81 | 1.93 |
| | (0.2) | (5.3) | (4.4) | (0.0) | | | |
| (b) | 0.12 | 0.57 | −2.32 | – | −0.59 | 0.93 | 0.11[b] |
| | (0.4) | (9.0) | (3.3) | | (3.5) | | |
| 1963–1988 | | | | | | | |
| (c) | 1.71 | 0.47 | −0.52 | +0.48 | – | 0.39 | 2.10 |
| | (1.2) | (3.9) | (1.5) | (1.9) | | | |
| (d) | 0.44 | 0.68 | −0.92 | – | −0.57 | 0.49 | 0.17[b] |
| | (1.2) | (5.1) | (2.6) | | (3.0) | | |

[a]$t$-Values in parentheses; an asterisk indicates an alternative specification possibility.
[b]Durbin's $H$-statistic (as lagged dependent variable is taken as explanatory variable).

Therefore eq. (d) neatly describes the error correction mechanism in the wage negotiation process, and also gives an economic interpretation for it: Too large deviations of the wages from the wage space are 'corrected' by the threat of labour conflicts. We appreciate, however, that such conclusions may be too far reaching to be drawn from simple regression results based on macro time-series data. Further research on the demands and offers of the negotiating parties, and their willingness to make concessions during the bargain, may provide better insights into the validity of this argument.

In order to investigate further whether the equilibrating mechanism described above is due to strike threats, or whether it has another cause, we have split the sample period into two sub-periods (1950–1962; 1963–1988), in conformity with the institutional survey of section 2. It is apparent from eqs. (a) and (c) in table 6 that strikes did not have a significant effect on wage change before 1963. The coefficient has the wrong sign and does not differ significantly from zero. After 1963, however, strikes have a positive impact on wage changes. Because trade unions had renounced the strike weapon in the 1950–1963 period, strike threats would not have been credible. Thus, the lagged wage gap cannot capture strike threats issued by the registered trade unions. The unions could have used wildcat strikes, which represented the dissatisfaction of employees and of trade union members with the unions' moderated wage policy, as a strategic instrument. But eq. (a) in table 6 shows that these strikes did not affect wages, which indicates that wildcat strikes were not used as the strategic instrument as suggested above. As a result, the lagged wage-gap variable of eq. (b) in table 6 does not represent strike threats, but the equilibrating mechanism may be ascribed to the strong political consensus.

As consensus began to crumble in the 1960s, strikes have gained importance in Dutch wage determination and strike threats have subsequently played a more important role in wage determination. Comparison of eqs. (c) and (d) shows that substitution of strikes into the wage gap holds in the latter period. Nevertheless, the wage-gap variable may also capture the degree of consensus, which appears to be high in view of the relatively small number of working days lost to strikes. Finally, when comparing eqs. (b) and (d) in table 6, we note that our preferred wage formation mechanism (eq. (d) in table 5) shows stability over the sample period.

We would therefore select eq. (d) in table 5 with the error correction term, $gap_{-1}$, and the lagged change in the rate of unemployment, as a proper description of wage formation in the Netherlands, assuming that wages are generated by a process of order $I(2)$. Whereas the long-run solution of this wage equation implies that wage increases are equal to the wage space, the short-run dynamics appear to be somewhat more complicated, incorporating a Phillips-curve mechanism.

## 6. Conclusions

This paper illustrates the central role of the concept of wage space in wage negotiations and wage formation in the Netherlands. Most empirical wage equations are based on the presumption that wages are integrated of order $I(1)$. Under this presumption we arrive at an error correction term in the Dutch wage equation which is similar to that in other studies for this country, but in which no role for labour conflicts as an error correction mechanism can be identified. However, integration tests suggests that wages are of order $I(2)$, and it is shown that wage changes and wage space are co-integrated in the Netherlands, implying the existence of a stable relationship between these two variables. When wage increases are below or above the wage space for some time, this will be corrected in the outcome of the next wage negotiations. In most negotiation rounds in the Netherlands, there has been a general consensus, or even a central agreement, on the desired increase in wages in relation to the wage space. This consensus or agreement may (at macro level) be interpreted as the protocol to avoid strikes, as joint cost theory suggests for the micro level. Phillips-curve effects are shown to play a role in the short run only.

Since actual strike activity is low in the Netherlands as compared to its neighbouring countries [with the exception of West Germany; see Walsh

wage space provides the room for wage increases, rather than to actual labour conflicts as an error correction mechanism. This conclusion underlines

the importance of specific institutional aspects in the modelling of labour relations.

## Appendix A. List of symbols and definitions

*aiq* labour–income ratio, defined as the wage sum per employee multiplied by the sum of the number of employees in enterprises and the self-employed divided by the net national product;

$aiq_c$ idem, but corrected for capital intensive industries like the production of natural gas, public utilities, and housing;

*gap* wage gap in *levels*: $\log w - \log ws$;

$\dot{gap}$ wage gap in *percentage changes*: $\dot{w} - (\dot{p}_c + \dot{h})$;

*h* labour productivity, defined as the ratio of the firms' gross value added to the number of employees working in firms (labour years), deflated by value added prices;

*wdl* number of working days lost to strikes;

$p_c$ index of consumer prices (1980 = 100);

$p_y$ index of value added prices (1980 = 100);

*tp* tax pressure, constructed as the ratio of the total amount of direct taxes and social premiums to the number of private and public sector employees;

*ws* cumulated wage space, defined as $\log p_c + \log h$. (The wage space in value added prices is defined as: $\log p_y + \log h$);

*u* unemployment rate;

*w* wage sum per employee, defined as the ratio of the wage bill to the number of employees.

dot notation indicates percentage changes;
log indicates a natural logarithm.

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